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IS 8733 (1978): Tolerances for single start gear hobs [PGD 32: Cutting tools]

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"Knowledge is such a treasure which cannot be stolen"

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UDC 621·914·6 : 621·833 : 621·753·1

IS : 8733 - 1978

(Reaffirmed 2002)

Indian Standard

TOLERANCES FOR SINGLE START GEAR HOBS

1. Scope — Covers the tolerances for single start gear hobs, suitable for modules 1 to 20, conforming to IS : 2535-1978 ' Basic rack and modules of cylindrical gears for general engineering and heavy engineering (*second revision*) '. The tolerances specified in the standard apply to all pressure angles.

2. Grades

2.1 Gear hobs shall be classified into the following grades of accuracy:

Grade AA	High precision ground hobs
Grade A	Precision ground hobs
Grade B	Commercial ground hobs
Grade C	Precision unground hobs
Grade D	Commercial unground hobs

2.2 Bearing surface length of bore for all grades shall be 66 percent except for Grade AA.

Small Tools Sectional Committee, EDC 45; Milling Cutters (Including Arbors) Subcommittee, EDC 45 : 2 [Ref : Doc : EDC 45 (2023)]

EXPLANATORY NOTE

In the preparation of this standard considerable assistance has been derived from DIN 3968-1960 ' Toleranzen eingangiger Walzfraser fur Stirnrader mit Evolventenverzahnung (Tolerances for single-start hobs for involute spur gears) ' issued by Deutsches Institut für Normung.

Adopted 23 February 1978

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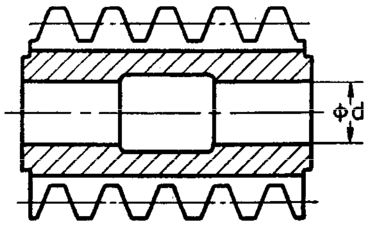
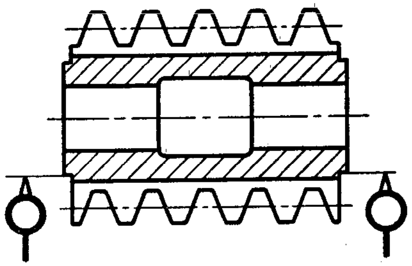
3. Tolerances

All tolerances in micrometres (1 micrometre = 0·001 mm).

Sl No.	Element to be Checked	Illustration	Symbol for Tolerance	Grade	Module							
					For 1	Over 1 Up to 1·6	Over 1·6 Up to 2·5	Over 2·5 Up to 4	Over 4 Up to 6·3	Over 6·3 Up to 10	Over 10 Up to 16	Over 16 Up to 20
1	Tolerance on bore diameter (d)*		—	AA	H5†							
				A	H5†							
				B	H6†							
				C	H6†							
				D	H7†							
2	Form tolerance of bore*	—	—	All grades	One half the bore tolerance							
3	Interchangeable tolerance for keyway	—	—	All grades	According to IS : 6285-1971 ‘ Dimensions for interchangeability of milling cutters and milling arbors with key drive ’							
4	Radial runout of hub diameter with respect to bore axis		f_{rp}	AA	5	5	5	5	5	5	6	6
				A	5	5	5	6	8	10	12	16
				B	6	6	6	8	10	12	16	20
				C	10	10	10	12	16	20	25	32
				D	Not defined							

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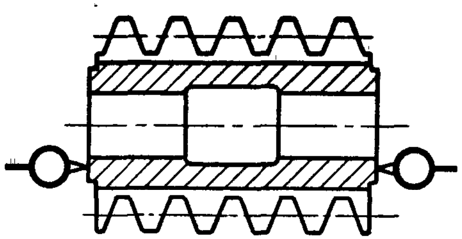
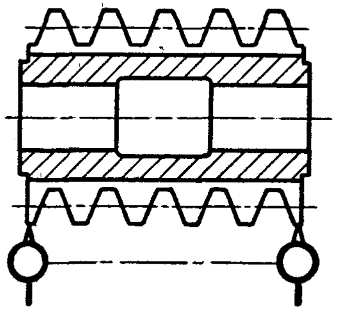
*Bores with recess are to be treated as a single-diameter through bore with regard to diameter and form tolerances. For hobs of Grade AA, it is desirable that the bore should not be made with a recess.

†According to IS : 919-1963 ‘ Recommendations for limits and fits for engineering (*revised*) ’.

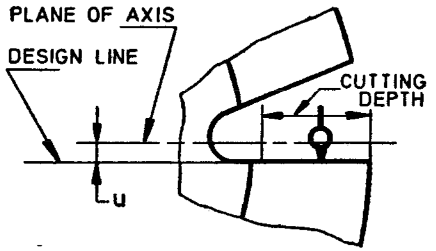
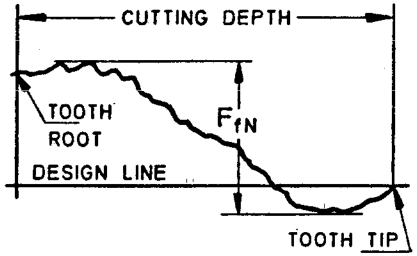
(*Continued*)

All tolerances in micrometres (1 micrometre = 0·001 mm).

Sl No.	**Element to be Checked**	**Illustration**	**Symbol for Tolerance**	**Grade**	**Module**							
					For 1	Over 1 Up to 1·6	Over 1·6 Up to 2·5	Over 2·5 Up to 4	Over 4 Up to 6·3	Over 6·3 Up to 10	Over 10 Up to 16	Over 16 Up to 20
5	Axial runout of hub on both faces with respect to bore axis		f_{ps}	AA	3	3	3	3	3	4	5	5
				A	3	3	3	5	5	8	8	10
				B	4	4	4	6	6	10	10	12
				C	6	6	6	10	10	16	16	20
				D	10	10	12	16	16	25	25	32
6	Radial runout on tooth tips with respect to bore axis		f_{rk}	AA	10	10	12	16	20	25	32	40
				A	12	16	20	25	32	40	50	63
				B	25	32	40	50	63	80	100	125
				C	50	63	80	100	125	160	200	250
				D	100	125	160	200	250	315	400	500

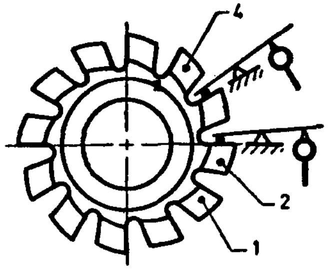
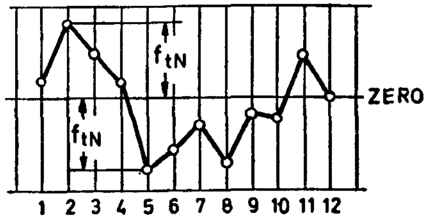
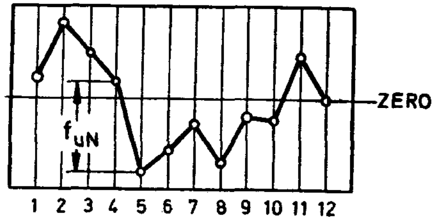
(*Continued*)

All tolerances in micrometres (1 micrometre = 0·001 mm).

Sl No.	**Element to be Checked**	**Illustration**	**Symbol for Tolerance**	**Grade**	**Module**							
					For 1	Over 1 Up to 1·6	Over 1·6 Up to 2·5	Over 2·5 Up to 4	Over 4 Up to 6·3	Over 6·3 Up to 10	Over 10 Up to 16	Over 16 Up to 20
7	Form and positional tolerance of cutting faces	 DISTANCE u IS THE AMOUNT BY WHICH DESIGN LINE IS DISTANT FROM PLANE OF HOB AXIS (ZERO WHEN RAKE ANGLE IS 0°)  CUTTING DEPTH TOOTH ROOT F_{fN} DESIGN LINE TOOTH TIP TEST DIAGRAM	F_{fN}	AA	10	10	12	16	20	25	32	40
				A	12	16	20	25	32	40	50	63
				B	25	32	40	50	63	80	100	125
				C	50	63	80	100	125	160	200	250
				D	100	125	160	200	250	315	400	500

(*Continued*)

All tolerances in micrometres (1 micrometre = 0·001 mm).

Sl No.	Element to be Checked	Illustration	Symbol for Tolerance	Grade	Module							
					For 1	Over 1 Up to 1·6	Over 1·6 Up to 2·5	Over 2·5 Up to 4	Over 4 Up to 6·3	Over 6·3 Up to 10	Over 10 Up to 16	Over 16 Up to 20
8	Tolerance on tooth spacing at the middle of the tooth height	  TEST DIAGRAM	f_{tN}*	AA	±10	±10	±12	±16	±20	±25	±32	±40
				A	±12	±16	±20	±25	±32	±40	±50	±63
				B	±25	±32	±40	±50	±63	±80	±100	±125
				C	±50	±63	±80	±100	±125	±160	±200	±250
				D	±100	±125	±160	±200	±250	±315	±400	±500
9	Maximum tooth spacing error between two adjacent teeth		f_{uN}†	AA	10	10	12	16	20	25	32	40
				A	12	16	20	25	32	40	50	63
				B	25	32	40	50	63	80	100	125
				C	50	63	80	100	125	160	200	250
				D	100	125	160	200	250	315	400	500

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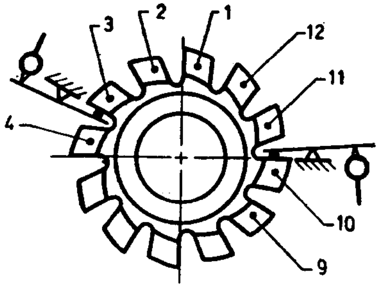
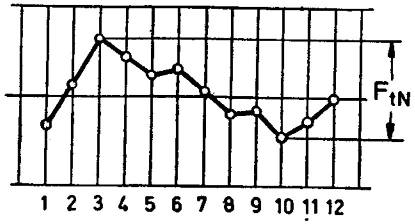
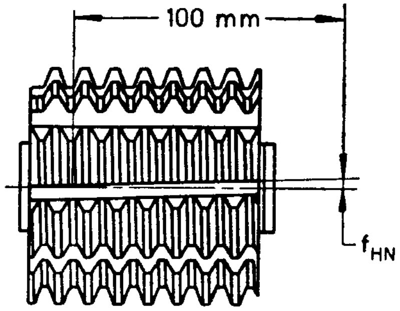
*f_{tN} is the difference between the actual value and designed value of the gash spacing.

†Tooth spacing error f_{uN} is the actual difference in the spacing of two adjacent gashes.

(*Continued*)

All tolerances in micrometres (1 micrometre = 0·001 mm).

Sl No.	Element to be Checked	Illustration	Symbol for Tolerance	Grade	Module							
					For 1	Over 1 Up to 1·6	Over 1·6 Up to 2·5	Over 2·5 Up to 4	Over 4 Up to 6·3	Over 6·3 Up to 10	Over 10 Up to 16	Over 16 Up to 20
10	Maximum cumulative tooth spacing error measured at half tooth height	  TEST DIAGRAM	F_{tN}*	AA	20	20	25	32	40	50	63	80
				A	25	32	40	50	63	80	100	125
				B	50	63	80	100	125	160	200	250
				C	100	125	160	200	250	315	400	500
				D	200	250	315	400	500	630	800	1 000
11	Lead error of gash over 100 mm hob length		f_{HN}	AA	± 50							
				A	± 70							
				B	± 100							
				C	± 140							
				D	± 200							

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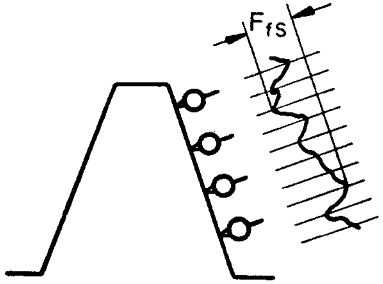
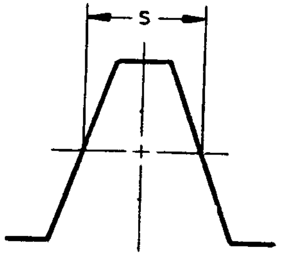
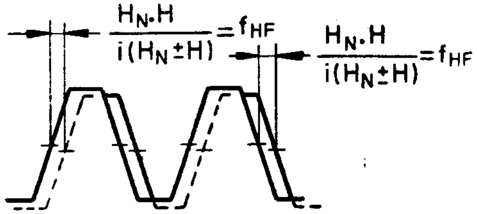
*The tolerance F_{tN} is referred to the total pitch error, that is to say that the largest cumulative pitch error measured on the hob tested.

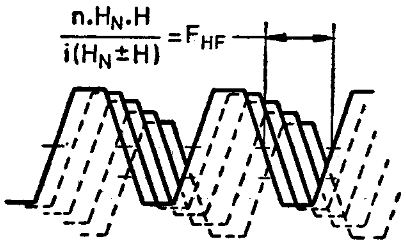
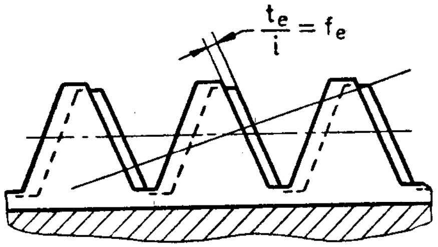
(Continued)

All tolerances in micrometres (1 micrometre = 0·001 mm).

Sl No.	Element to be Checked	Illustration	Symbol for Tolerance	Grade	Module							
					For 1	Over 1 Up to 1·6	Over 1·6 Up to 2·5	Over 2·5 Up to 4	Over 4 Up to 6·3	Over 6·3 Up to 10	Over 10 Up to 16	Over 16 Up to 20
12	Permissible error over the straight flank from the design form		F_{fs}	AA	6	6	6	8	10	12	14	18
				A	10	11	12	14	16	20	25	32
				B	20	22	25	28	32	40	50	63
				C	40	45	50	56	63	80	100	125
				D	Not defined							
13	Tolerance on tooth thickness on the pitch cylinder		f_s	AA	− 16	− 16	− 16	− 20	− 25	− 32	− 40	− 50
				A	− 25	− 28	− 32	− 36	− 40	− 50	− 63	− 80
				B	− 50	− 56	− 63	− 71	− 80	− 100	− 125	− 160
				C	− 100	− 112	− 125	− 140	− 160	− 200	− 250	− 320
				D	− 100	− 112	− 125	− 140	− 160	− 200	− 250	− 320
14	Hob lead from cutting edge to cutting edge in the direction of hand	 $\frac{H_N \cdot H}{i(H_N \pm H)} = f_{HF}$ $\frac{H_N \cdot H}{i(H_N \pm H)} = f_{HF}$ where H_N = lead of gashes, H = hob lead (helix), and i = number of gashes or tooth rows. The sign in the parentheses is plus (+) if gash lead and the hob lead are in the opposite direction, and negative (−) if they are in the same direction	f_{HF}	AA	± 4	± 4	± 4	± 5	± 6	± 8	± 10	± 12
				A	± 6	± 7	± 8	± 9	± 10	± 12	± 16	± 20
				B	± 12	± 14	± 16	± 18	± 20	± 25	± 32	± 40
				C	± 25	± 28	± 32	± 36	± 40	± 50	± 63	± 80
				D	± 50	± 56	± 63	± 71	± 80	± 100	± 125	± 160

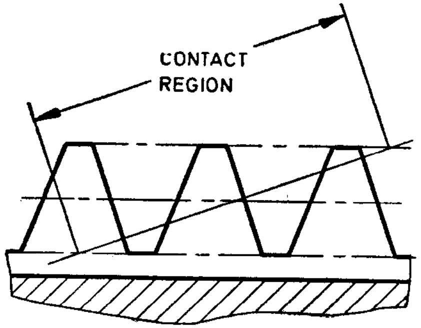
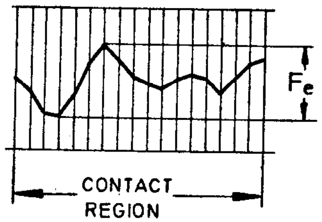
(*Continued*)

All tolerances in micrometres (1 micrometre = 0·001 mm).

Sl No.	Element to be Checked	Illustration	Symbol for Tolerance	Grade	Module							
					For 1	Over 1 Up to 1·6	Over 1·6 Up to 2·5	Over 2·5 Up to 4	Over 4 Up to 6·3	Over 6·3 Up to 10	Over 10 Up to 16	Over 16 Up to 20
15	Hob lead in the direction of hand between any two cutting edges on the same thread	 where H_N = Lead of gashes, H = hob lead (helix), i = number of gashes or tooth rows, and n = number of cutting edges on which the measurement is made. The sign in the parentheses is plus (+) if gash lead and the hob lead are in the opposite direction, and negative (−) if they are in the same direction	F_{HF}	AA	6	6	6	8	10	12	14	18
				A	10	11	12	14	16	20	25	32
				B	20	22	25	28	32	40	50	63
				C	40	45	50	56	63	80	100	125
				D	80	90	100	112	125	160	200	250
16	Individual base pitch error	 where t_e = base pitch, and i = number of gashes	f_e	AA	±4	±4	±4	±5	±6	±8	±10	±12
				A	±6	±7	±8	±9	±10	±12	±16	±20
				B	±12	±14	±16	±18	±20	±25	±32	±40
				C	±25	±28	±32	±36	±40	±50	±63	±80
				D	Not defined							

(*Continued*)

All tolerances in micrometres (1 micrometre = 0·001 mm).

Sl No.	Element to be Checked	Illustration	Symbol for Tolerance	Grade	Module							
					For 1	Over 1 Up to 1·6	Over 1·6 Up to 2·5	Over 2·5 Up to 4	Over 4 Up to 6·3	Over 6·3 Up to 10	Over 10 Up to 16	Over 16 Up to 20
17	Cumulative base pitch error within the contact region	  TEST DIAGRAM	F_e	AA	8	8	8	10	12	16	20	25
				A	12	14	16	18	20	25	32	40
				B	25	28	32	36	40	50	63	80
				C	50	56	63	71	80	100	125	160
				D	Not defined							
18	Diameter tolerance over hob length	—	—	AA	8	8	10	12	16	20	25	32
				A	10	12	16	20	25	32	40	50
				B	20	25	32	40	50	63	80	100
				C	40	50	63	80	100	125	160	200
				D	Not defined							

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